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29	Creep Strength of Metals
30	Stress-Rupture Strength of High Temperature Alloys
32	Effect of Radiation on Materials

Specific Gravity*

Material	High	Low	Material	High	Low
Osmium	22.7	—	Heat Resistant Alloys (cast)	8.14	7.53
Iridium	22.5	—	Chromium Carbide Cermet	8.1	6.9
Platinum	21.5	—	Austenitic Stainless Steels	8.02	7.75
Tungsten	19.4	—	Stainless Steels (cast)	7.99	7.52
Gold	19.3	—	Age Hardenable Stainless Steels	7.94	7.63
Uranium	19.1	—	High Temperature Steels	7.88	7.77
Tantalum	16.6	—	Carbon Steels	7.83	—
Tungsten Carbide Cermet	15.2	13	Free-Cutting Steels	7.83	—
Hafnium	13	—	Low Alloy Steels (cast)	7.83	—
Tungsten-Titanium Carbide Cermet	13	10.5	Nitriding Steels	7.83	—
Rhodium	12.4	—	Ultra High Strength Steels	7.83	7.63
Ruthenium	12.2	—	Tin-Base Babbitts	7.76	7.34
Palladium	12	—	Ferritic Stainless Steels	7.75	7.47
Thorium	11.6	—	Low Alloy Steels	7.75	—
Lead & Its Alloys	11.3	10.7	Martensitic Stainless Steels	7.75	—
Lead-Base Babbitts	10.62	9.30	Wrought Irons	7.69	—
Silver	10.5	—	Austenitic Nodular Irons	7.43	—
Molybdenum	10.2	—	Aluminum Bronzes (cast)	7.33	7.55
Yellow Brasses (cast)	9.96	7.70	Tin & Its Alloys	7.30	7.25
Tin Bronzes (cast), High Leaded	9.49	8.85	Malleable Irons	7.29	7.13
Cobalt-Base Superalloys	9.13	8.30	Nodular Irons	7.21	7.17
Copper	8.95	8.89	Titanium Carbide Cermet	7.2	5.5
Cupro-Nickels	8.94	—	Gray Irons	7.19	—
Nickel Brasses & Bronzes (cast), Leaded	8.92	8.82	Zinc & Its Alloys	7.17	6.64
Silicon Bronzes	8.91	7.09	Heat Resistant Nodular Irons	6.9	—
Red & Semi-Red Brasses (cast), Leaded	8.90	8.56	Zirconium & Its Alloys	6.64	6.56
Chromium Copper	8.88	—	Vanadium	6.36	—
Phosphor Bronzes	8.88	8.74	Alumina Cermets	6.09	5.81
Cobalt	8.86	—	Molybdenum Disilicide	6	5.9
Gilding, 95%	8.86	—	Titanium & Its Alloys	4.73	4.43
Tin Bronzes (cast), Leaded	8.85	8.60	Lead Silicate Glasses	4.3	3
Monel	8.84	8.48	Zircon	3.9	3.4
Leaded Commercial Bronze	8.83	—	Alumina Ceramics	3.85	3.45
Leaded Brasses	8.82	8.41	Micas	3.8	2.6
Commercial Bronze, 90%	8.8	—	Epoxies (cast), Ht Res	3.2	1.15
Nickel Silvers	8.74	8.66	Silicon Carbide	3.1	2.6
Red Brass, 85%	8.74	—	Silicon Nitride	3.1	—
Low Brass, 80%	8.66	—	Aluminum & Its Alloys (cast)	2.96	2.57
Cr-Ni-Co-Fe Superalloys	8.60	8.19	Forsterite	2.9	—
Columbium	8.58	—	Steatite	2.9	2.5
Tin & Aluminum Brasses	8.53	8.33	Aluminum & Its Alloys	2.82	2.62
Admiralty Brass	8.52	—	Aluminum Silicate Fibers	2.7	—
Cartridge Brass, 70%	8.52	—	Cordierite	2.7	2.3
Yellow Brass	8.47	—	Asbestos Fibers	2.6	2.4
Duranickel & Inconel	8.44	8.08	Polycrystalline Glass	2.6	2.5
Leaded Naval Brass	8.44	—	Glass Fibers	2.54	—
Naval Brass	8.41	—	Aluminum Silicate Glass	2.5	—
Nickel-Base Superalloys	8.4	7.9	Boron Carbide	2.5	1.9
Muntz Metal	8.38	—	Soda-Lime Glasses	2.5	—
Manganese Bronze (A)	8.36	—	Standard Electrical Ceramics	2.5	2.4
Aluminum Brass	8.33	—	Epoxies (cast), GP	2.4	1.12
Beryllium Copper	8.24	8.18	Borosilicate Glasses	2.3	2.1
Low Expansion Nickel Alloys	8.19	8.08	Fluorocarbon Fiber	2.3	—
Cr-Ni-Fe Superalloys	8.17	7.88	TFE Fluorocarbons	2.3	2.1
			Alkyds, GP	2.24	2.22

* Values represent high and low sides of a range of *typical* values.

Specific Gravity[a]

Material ⬇	High	Low	Material ⬇	High	Low
Plastics Laminates, Low Pressure	2.2	1.2	Epoxies (cast), Resilient	1.25	—
Silica Glasses	2.2	—	Neoprene Rubber	1.25	—
Alkyds, Electrical	2.15	2.05	Silicone Rubber	1.25	—
CFE Fluorocarbons	2.15	2.10	Urethane Rubber	1.25	—
TFE Film	2.15	—	Cellulose Propionate	1.24	1.18
CFE Film	2.11	—	Phenolics (molded)	1.24	3
Boron Nitride	2.1	—	Polycarbonate	1.20	—
Alkyds, Impact	2.08	2	Polyvinyl Butyral	1.20	1.07
Melamines	2	1.43	Acrylics, GP	1.19	1.17
Silicones (molded)	2	1.6	Acrylics, High Impact	1.16	1.12
Hard Rubber	1.95	1.15	Ethyl Cellulose	1.16	1.10
Graphite	1.9	1.4	Ethyl Cellulose Film	1.16	1.14
Beryllium	1.85	—	Rubber Hydrochloride Film	1.15	1.12
Epoxies (molded)	1.85	—	Nylons 6, 11, 66 & 610	1.14	1.09
Plastics Laminates, High Pressure	1.78	1.15	Nylon 6 Film	1.12	—
Magnesium Alloys	1.76	1.68	Modified Polystyrenes	1.11	1.04
Vinylidene Chloride	1.75	1.68	Nylon Fiber	1.1	—
Diallyl Phthalate, Asbestos-Filled	1.70	1.65	Imported Woods	1.09	0.14
Vinyl Fibers	1.7	1.3	Polystyrene Film	1.07	1.05
Polyvinylidene Chloride Film	1.68	—	Polystyrenes, GP	1.07	1.04
Bast Fibers	1.6	1.5	ABS Resins	1.06	1.01
Carbon	1.6	1.5	Methylstyrenes	1.06	1.01
Cotton Fiber	1.6	—	Nitrile Rubber	1	—
Diallyl Phthalate, Glass Fiber-Filled	1.59	1.55	Polyethylene Fibers	0.96	0.92
Cellophane	1.55	1.40	Polyethylenes, High Density	0.96	0.94
Polyvinyl Chloride	1.55	1.16	Polyethylene Film	0.945	0.92
Ureas	1.52	1.47	Polyethylenes, Medium Density	0.94	0.93
Nylon, Glass-Filled	1.51	1.30	Styrene-Butadiene Rubber	0.94	—
Cellulosic Fibers	1.5	1.3	Natural Rubber	0.93	—
Fluorinated Acrylic Rubber	1.5	—	Polyethylenes, Low Density	0.925	0.910
Polyvinyl Chloride Film	1.50	1.15	Polypropylene	0.91	0.90
Allyls (cast)	1.46	1.20	Polypropylene Fiber	0.91	0.9
Cellulosic Films	1.46	1.16	Butyl Rubber	0.90	—
Polyesters (cast)	1.46	1.06	Polypropylene Film	0.90	—
Acetal	1.43	—	Wood Comp Board, Softboard	0.8	0.2
Acrylic Fibers	1.4	1.1	American Hardwoods	0.7	0.4
Animal Fibers	1.4	1.3	Wool Felts, Sheet	0.7	0.3
Cellulose Nitrate	1.40	1.35	American Softwoods	0.5	0.4
Chlorinated Polyether	1.4	—	Neoprene Foams	0.48	0.16
Diallyl Phthalate, Dacron Filled	1.4	—	Polyethylene Foam, Flexible	0.47	—
Polyester Fibers	1.4	—	Butadiene-Acrylonitrile Foam	0.4	0.16
Polyvinyl Formal	1.4	1.2	Urethane Foamed-in-Place, Rigid	0.4	0.008
Wood Comp Board, Hardboard	1.4	0.08	Wool Felts, Roll	0.4	0.2
Polyester Film	1.39	—	Prefoamed Epoxy, Rigid	0.32	0.08
Polysulphide Rubber	1.35	—	Urethane Foams, Flexible	0.32	0.016
PVC-Nitrile Rubber Blend Film	1.35	1.18	Silicone Foams, Rigid	0.26	0.19
Cellulose Acetate	1.34	1.23	Phenolic Foamed-in-Place, Rigid	0.16	0.03
Diallyl Phthalate, Orlon Filled	1.34	1.31	Polystyrene Foamed-in-Place, Rigid	0.16	0.032
Phenolics (cast)	1.33	1.31	Prefoamed Cellulose Acetate, Rigid	0.13	0.06
Polystyrenes, Glass-Filled	1.32	1.25	Natural Rubber Foam	0.112	0.096
Polyvinyl Alcohol	1.31	1.21	Butadiene-Styrene Foams	0.07	—
Polyvinyl Alcohol Film	1.31	1.21	Prefoamed Polystyrene, Rigid	0.07	0.02
Wood Comp Board, Particle	1.28	0.42	Vinyl Foams, Flexible	>0.064	—
Cellulose Acetate Butyrate	1.25	1.15			

[a] Values represent high and low sides of a range of *typical* values.

Thermal Conductivity[a]

Btu/hr/sq ft/°F/ft

Material	High	Low	Material	High	Low
Silver[b]	242	—	Austenitic Stainless Steels[b]	9.4	8
Copper	226	196	Columbium Carbide	8.2	—
Chromium Copper	187	—	Carbon[b]	5	3
Gold[b]	172	—	Calcia[d]	4.1	—
Aluminum & Its Alloys	135	67.4	Zircon	3.6	2.9
Plain Brasses	135	67	Cordierite & Forsterite	2.4	0.9
Graphite[b]	120	70	Polycrystalline Glass	2.1	1.1
Phosphor Bronzes	120	29	Steatite	1.94	1.45
Beryllium Copper	110	100	Electrical Ceramics	1.6	0.9
Leaded Brasses	104	67	Magnesia[d]	1.5	—
Tungsten[b]	96.6	—	Wood Comp Board	1.5	0.08
Aluminum & Its Alloys (cast)	92.5	51.0	Wool Felts (1 in.), Sheet	0.91	0.30
Beryllium[b]	87	—	Silicon Nitride[d]	0.9	—
Molybdenum[b]	84.5	—	Epoxies (cast)	0.8	0.1
Magnesium Alloys	80	24	Silica Glasses[b]	0.8	—
Tin & Aluminum Brasses	67	58	Silica, Vitreous[d]	0.8	—
Zinc & Its Alloys	65.3	60.5	Borosilicate Glasses[b]	0.7	—
Tungsten Carbide Cermet	50.1	25.7	Alkyds	0.60	0.20
Rhodium[b]	50	—	Wood Comp Board, Softboard	0.6	0.3
Platinum[b]	42	—	Lead Silicate & Soda-Lime Glasses[b]	0.5	—
Palladium[b]	41	—	Zirconia[d]	0.5	—
Low Alloy Steels[b]	38.5	21.7	Polyvinyl Alcohol	0.46	—
Tin & Its Alloys	37	34	Melamines	0.41	0.17
Nickel & Its Alloys[b]	36	8.7	Micas	0.4	0.2
Wrought Irons[b]	34.5	—	Phenolics (molded)	0.39	0.10
Gray Irons (cast)[b]	34	24	Wool Felts (1 in.), Roll	0.39	0.24
Iridium[b]	34	—	Plastics Laminates, High Pressure	0.29	0.17
Aluminum Bronzes (cast)	33	22	Ureas	0.24	0.17
Tungsten-Titanium Carbide Cermet	32.9	16.5	Cellulose Acetate & Propionate	0.19	0.10
Columbium & Tantalum[b]	31.5	—	Polyethylenes	0.19	—
Silicon Bronzes	31	20	Ethyl Cellulose	0.17	0.09
Nitriding Steels[b]	30	—	Acrylics	0.15	0.10
Malleable Irons	29.5	—	CFE Fluorocarbons	0.145	—
Alumina Cermets[c]	29	—	Nylons 6, 11, 66 & 610	0.14	0.10
Silicon Carbide[d]	29	9	Styrene-Butadiene & Nitrile Rubber	0.14	—
Tin Bronzes (cast), Leaded	28	—	TFE Fluorocarbons	0.14	—
Carbon & Free-Cutting Steels[b]	27	—	Acetal	0.13	—
Low Alloy Steels (cast)[b]	27	—	Cellulose Nitrate	0.13	—
Tin Bronzes (cast), High Leaded	27	—	ABS Resins	0.12	0.08
Cupro-Nickels & Nickel Silvers	26	17	Nylon, Glass-Filled	0.12	—
Thorium	21.4	—	Polyesters (cast)	0.12	0.10
Martensitic Stainless Steels[b]	21.2	11.7	Silicone Rubber	0.12	0.11
Nodular or Ductile Irons[b]	20	18	Neoprene Rubber	0.11	—
Lead & Its Alloys[b]	19.6	16.0	Polycarbonate[a]	0.11	—
Cobalt-Base Superalloys[c]	18.0	11.9	Polyvinyl Chloride	0.10	0.07
High-Temperature Steels[c]	17.3	15.8	Silicones (molded)	0.097	0.089
Boron Nitride[c]	16.6	—	Polyvinyl Formal	0.09	—
Ultra High Strength Steels[c]	16.6	—	Natural Rubber	0.08	—
Boron Carbide[d]	16	—	Polypropylene	0.08	—
Heat Resistant Alloys (cast)[b]	51.2	7.7	Polystyrenes, GP	0.08	0.06
Ferritic Stainless Steels[b]	15.1	12.1	Modified Polystyrenes	0.07	0.02
Cr-Ni-Fe Superalloys[c]	15	12.2	Butyl Rubber	0.05	—
Nickel-Base Superalloys[c]	15	9.5	Vinylidene Chloride	0.05	—
Stainless Steels (cast)[b]	14.5	8.2	Urethane Foamed-in-Place, Rigid	0.03	0.01
Uranium	14.5	—	Neoprene Foams	0.029	0.021
Tin-Lead-Antimony Alloys[b]	14	—	Prefoamed Cellulose Acetate, Rigid	0.027	0.025
Tantalum Carbide	12.8	—	Butadiene-Acrylonitrile Foams	0.025	0.021
Age Hardenable Stainless Steels[b]	12.1	8.87	Natural Rubber Foam	0.025	0.021
Zirconium Carbide	11.9	—	Silicone Foams, Rigid	0.025	—
Alumina Ceramics[b]	10.7	6.2	Phenolic Foamed-in-Place, Rigid	0.02	—
Low Expansion Nickel Alloys[b]	10.3	7.8	Polystyrene Foamed-in-Place, Rigid	0.02	—
Titanium Carbide	9.9	—	Prefoamed Epoxy, Rigid	0.02	—
Titanium & Its Alloys[b]	9.8	4.3	Prefoamed Polystyrene, Rigid	0.02	—
Zirconium & Its Alloys[b]	9.6	8.1	Butadiene-Styrene Foams	0.018	—
Beryllia[d]	9.52	—	Thoria[d]	0	—

[a] Values represent high and low sides of a range of *typical* values at room temperature except where noted.
[b] At temperatures between 120 and 212 F. [c] At temperatures between 212 and 1800 F. [d] At temperatures above 1800 F.

Coefficient of Thermal Expansion[a]

10^{-6} in./in./°F

Material	High	Low	Material	High	Low
Silicone Rubber	670	—	Cupro-Nickels & Nickel Silvers[c]	9.3	9
Nitrile Rubber	390	—	Nickel & Its Alloys[d]	9.2	6.8
Natural Styrene-Butadiene Rubber	370	—	Cr-Ni-Co-Fe Superalloys[d]	9.1	8
Neoprene Rubber	340	—	Low Alloy Steels[d]	8.6	6.3
Butyl Rubber	320	—	Carbon Free-Cutting Steels[d]	8.4	8.1
Polyethylenes, Medium & High Density	167	83	Low Alloy Steels (cast)[d]	8.3	8
Polyvinyl Butyral	127	44	Age Hardenable Stainless Steels[c]	8.2	5.5
Ethyl Cellulose	110	55	Gold[c]	7.9	—
Polyethylenes, Low Density	110	89	High Temperature Steels[d]	7.9	6.3
Silicon Bronzes[c]	100	98	Magnesia[c]	7.8	—
Cellulose Acetate & Propionate	90	44	Ultra High Strength Steels[d]	7.61	5.68
Vinylidene Chloride	87.8	—	Calcia[c]	7.6	—
Nylons 6 & 11	71	46	Malleable Irons[c]	7.5	5.9
Polyvinyl Alcohol	66.5	38.8	Titanium Carbide Cermet[d]	7.5	4.3
Cellulose Nitrate	66	44	Wrought Irons[c]	7.4	—
Phenolics (cast)	66	33	Titanium & Its Alloys[d]	7.1	4.9
Polypropylene	62	—	Cobalt[d]	6.8	—
ABS Resins and Modified Polystyrenes	56	22	Martensitic Stainless Steels[c]	6.5	5.5
Polyesters (cast)	56	28	Nitriding Steels[d]	6.5	—
Nylons 66 & 610	55	—	Palladium[c]	6.5	—
TFE Fluorocarbons	55	—	Beryllium[b]	6.4	—
Acrylics and Epoxies (cast)	50	30	Chromium Carbide Cermet[c]	6.3	5.8
Urethane Foams	50	14	Thorium[b]	6.2	—
Acetal and Chlorinated Polyether	45	44	Ferritic Stainless Steels[c]	6	5.8
Polystyrenes, GP	44	33	Gray Irons (cast)[c]	6	—
Polyvinyl Formal	42.7	35.5	Beryllium Carbide[d]	5.8	—
Polycarbonate	39	—	Low Expansion Nickel Alloys[c]	5.5	1.5
CFE Fluorocarbons	38.8	—	Beryllia & Thoria[c]	5.3	—
Diallyl Phthalate	35	15	Alumina Cermets[d]	5.2	4.7
Silicones (molded)	32.2	4.5	Lead Silicate Soda-Lime Glasses[c]	5.1	4.8
Melamines and Alkyds	31.7	8.2	Molybdenum Disilicide[c]	5.1	—
Micas, Natural & Synthetic[b]	27	18	Ruthenium[b]	5.1	—
Phenolics (molded)	25	8.3	Platinum[c]	4.9	—
Prefoamed Cellulose Acetate, Rigid	25	20	Vanadium[b]	4.8	—
Prefoamed Polystyrene, Rigid	25	—	Forsterite[c]	4.7	—
Polystyrenes, Glass-Filled	24	22	Rhodium[b]	4.6	—
Prefoamed Epoxy, Rigid	22	16	Tantalum Carbide[d]	4.6	—
Mica, Glass-Bonded[b]	20	5.8	Boron Nitride[d]	4.3	—
Zinc & Its Alloys[c]	19.3	10.8	Titanium Carbide[d]	4.1	—
Nylon, Glass-Filled	17	12.5	Polycrystalline Glass[c]	4	0.2
Plastics Laminates, High Pressure	17	5.5	Steatite[c]	4	3.3
Lead & Its Alloys[c]	16.3	14.4	Tungsten Carbide Cermet[c]	3.9	2.5
Magnesium Alloys[b]	16	14	Columbium[d]	3.82	—
Ureas	15	12	Iridium[b]	3.8	—
Tin-Lead-Antimony Alloys[c]	14.6	10.9	Alumina Ceramics[c]	3.7	3.1
Epoxies (molded)	14	—	Zirconium Carbide[d]	3.7	—
Plastics Laminates, Low Pressure	14	10	Osmium and Tantalum[b]	3.6	—
Aluminum & Its Alloys[c]	13.7	11.7	Zirconium & Its Alloys[b]	3.6	3.1
Tin & Its Alloys[c]	13	—	Hafnium[b]	3.4	—
Uranium[c]	12.1	—	Polyvinyl Chloride	3.3	2.8
Tin & Aluminum Brasses[c]	11.8	10.3	Zirconia[c]	3.1	—
Plain & Leaded Brasses[c]	11.6	10	Molybdenum[b]	3	—
Silver[c]	10.9	—	Borosilicate Glasses[c]	2.5	1.8
Cr-Ni-Fe Superalloys[d]	10.5	9.2	Aluminum Silicate Glass[c]	2.3	—
Heat Resistant Alloys (cast)[d]	10.5	6.4	Silicon Carbide[c]	2.2	2.4
Nodular or Ductile Irons (cast)[c]	10.4	6.6	Tungsten[b]	2.2	—
Stainless Steels (cast)[d]	10.4	6.4	Cordierite[c]	2.1	—
Tin Bronzes (cast)[c]	10.3	10	Electrical Ceramics[c]	2	—
Austentic Stainless Steels[c]	10.2	9	Zircon[c]	1.8	1.3
Phosphor Bronzes[c]	10.2	9.6	Boron Carbide[c]	1.7	—
Coppers[c]	9.8	—	Carbon and Graphite[c]	1.5	1.3
Nickel-Base Superalloys[d]	9.8	7.7	Silicon Nitride[d]	1.4	—
Aluminum Bronzes (cast)[c]	9.5	9	Silica Glasses[c]	0.5	0.3
Cobalt-Base Superalloys[d]	9.4	6.8	Silica, Vitreous[c]	0.28	—
Beryllium Copper[c]	9.3	—	Wool Felts[b]	0	—

[a] Values represent high and low sides of a range of *typical* values. Values for plastics materials are for a range of temperatures between −22 and 86F (ASTM D696). [b] Value at room temperature only.
[c] Value for a temperature range between room temperature and 212–750 F.
[d] Value for a temperature range between room temperature and 1000–1800 F.
[e] Value for a temperature range between room temperature and 2200–2875 F.

Electrical Resistivity[a]

Microhm-cm

Material ↓	High	Low
Polyethylenes, Low Density	10^{25}	10^{23}
Polystyrenes, GP	10^{25}	10^{24}
TFE, FEP Fluorocarbons	10^{25}	—
CFE Fluorocarbon	10^{24}	—
Polymethylstyrene	5×10^{23}	2.0×10^{20}
Micas	10^{23}	10^{19}
Modified Polystyrenes	10^{23}	10^{18}
Polypropylene	$>10^{22}$	—
Polystyrenes, Glass-Filled	3.5×10^{22}	—
Polycarbonate	2.1×10^{22}	—
Acrylics, High Impact	2×10^{22}	—
Forsterite	2×10^{22}	—
Polycrystalline Glass	2×10^{22}	6.3×10^{9}
Plastics Laminates, Low Pressure	10^{22}	10^{17}
Polyvinyl Chloride	10^{22}	4×10^{17}
Vinylidene Chloride	10^{22}	10^{20}
Aluminum Silicate Glass[b]	$>10^{21}$	—
Borosilicate Glasses[b]	$>10^{21}$	10^{18}
Lead Silicate Glasses[b]	$>10^{21}$	10^{20}
Polyethylenes, Medium & High Density	$>10^{21}$	—
Silica Glasses[b]	$>10^{21}$	—
Epoxies (molded)	9×10^{21}	10^{20}
Nylon, Glass-Filled	5.5×10^{21}	1.5×10^{21}
Chlorinated Polyether	5×10^{21}	—
Acrylics (cast)	10^{21}	—
Cellulose Propionate	10^{21}	10^{18}
Nylons 6 & 11	10^{21}	10^{18}
Standard Electrical Ceramics	10^{21}	10^{19}
Cordierite	$>10^{20}$	—
Polyvinyl Butyral	$>10^{20}$	—
Steatite	$>10^{20}$	—
Zircon	$>10^{20}$	—
Acrylics, GP	10^{20}	—
Alkyds	10^{20}	—
Epoxies (cast), GP & Ht Res	10^{20}	10^{18}
Ethyl Cellulose	10^{20}	10^{18}
Melamines, GP	10^{20}	10^{18}
ABS Resins	$>8 \times 10^{19}$	0.5×10^{19}
Silicones (molded)	$>5 \times 10^{19}$	$>3.4 \times 10^{19}$
Acetal	$>4 \times 10^{19}$	—
Nylons 66 & 610	4.5×10^{19}	—
Boron Nitride	1.7×10^{19}	—
Allyls (cast)	$>10^{19}$	—
Cellulose Acetate	10^{19}	10^{16}
Melamines, Elec	10^{19}	10^{17}
Phenolics, Elec	10^{19}	6×10^{18}
Phenolics (molded), GP	10^{19}	10^{15}
Polyesters (cast), Rigid	10^{19}	—
Phenolics (cast), Mech & Chem	7×10^{18}	10^{18}
Cellulose Acetate Butyrate	10^{18}	10^{16}
Melamines, Shock Res	10^{18}	10^{15}
Phenolics (molded), Very High Shock	10^{18}	—
Polyesters (cast), Nonrigid	10^{18}	—
Ureas	5×10^{17}	5×10^{16}
Methylstyrene-Acrylonitrile	2.6×10^{17}	—
Cellulose Nitrate	1.5×10^{17}	10×10^{16}
Rubber Phenolics	10^{17}	10^{12}
Melamines, Glass Fiber-Filled	7×10^{16}	—
Diallyl Phthalate	2.5×10^{16}	10^{11}
Soda-Lime Glasses[b]	4×10^{15}	—
Beryllium Carbide	1.1×10^{6}	—
Carbon	4600	3500
Graphite	1300	800
Gray Irons	200	50
Titanium & Its Alloys	176	90
Nickel-Base Superalloys	148	118
Heat Resistant Alloys (cast)	112	70
Titanium Carbide	105	—
Cr-Ni-Fe Superalloys[b]	104	91
Austenitic Nodular Irons	102	—
Age Hardenable Stainless Steels	98	75.7
Cobalt-Base Superalloys	93	23.7
Stainless Steels (cast)	90	71
Low Expansion Nickel Alloys	81	48
Austenitic Stainless Steels	78	69
Columbium Carbide	74	—
Zirconium & Its Alloys	74	40
Martensitic Stainless Steels	72	40
Nodular Irons	68	66
Ferritic Stainless Steels	67	60
Nickel & Its Alloys[c]	65.3	8.3
Zirconium Carbide	63.4	—
Uranium	50	25
Pearlitic Malleable Irons	41.2	38.2
Cupro-Nickels	37	15
Standard Malleable Irons	32	—
Hafnium[c]	30	—
Low Alloy Steels (43XX, 48XX)	30	—
Nitriding Steels	29	27
Tin-Lead-Antimony Alloys	28.7	25.6
Low Alloy Steels (23XX)	28.4	—
Molybdenum Disilicide	27.2	21.5
Hard Leads	27.1	22
Vanadium	25	—
Low Alloy Steels (41XX)	22.3	—
Low Alloy Steels (51XX, 61XX)	21	—
Soft Leads	20.6	—
Low Alloy Steels (cast)	20	15
Tantalum Carbide	20	—
Carbon Steels	19	14.3
Low Alloy Steels (40XX)	19	—
Thorium	18	—
Low Alloy Steels (13XX)	17	—
Magnesium Alloys	17	5
Carbon Steels (cast)	16	13
Phosphor Bronzes	16	3.6
White Metal	15	—
Platinum	14.9	—
Free-Cutting Steels	14.3	—
Columbium	14.2	—
Tantalum	12.4	—
Wrought Irons	11.97	—
Grade A Tin	11.5	—
Palladium[c]	10.8	—
Osmium	9.5	—
Admiralty Metal, Ann	8.9	—
Ruthenium[c]	7.6	—
Tin & Aluminum Brasses	7.5	6.6
Leaded Brasses	6.6	4.1
Zinc Alloys (cast)	6.54	6.37
Yellow Brass, Ann	6.4	—
Aluminum & Its Alloys	6.3	2.8
Cartridge Brass, 70%, Ann	6.2	—
Zinc, CR	6.1	—
Zinc, HR	6.06	—
Beryllium Copper	5.82	4.82
Tungsten[c]	5.48	—
Low Brass, 80%, Ann	5.4	—
Iridium	5.3	—
Molybdenum[c]	5.17	—
Beryllium	5	—
Rhodium	4.51	—
Red Brass, 85%, Ann	4.7	—
Commercial Bronze, 90%, Ann	3.9	—
Gilding, 95%, Ann	3.1	—
Gold[c]	2.35	—
Copper	2.03	1.71
Silver	1.59	—

[a] Values represent high and low sides of a range of *typical* values at room temperature except where noted.
[b] At temperatures between 120 and 212 F. [c] At 32 F.

Dielectric Strength of Nonmetallics[a]

v/mil

Material	High	Low	Material	High	Low	Material	High	Low
Micas, Natural & Synthetic	2000	1000	Nylons 6 & 11	500	420	Polyvinyl Butyral	400	—
Polymethylstyrene	1950	890	Polyesters (cast), Allyl Type	500	330	Silicones (molded)	400	250
Polyvinyl Chloride	1400	24	TFE Fluorocarbons	500	400	Ureas	400	300
Plastics Laminates, High Pressure	1000	70	Polyethylenes	480	—	Rubber Phenolics	375	250
Polypropylene	820	769	Nylons 66 & 610	470	385	Melamines, Shock Res	370	130
Plastics Laminates, Low Pressure	800	100	Epoxies (molded)	468	334	Phenolics (molded), Very High Shock	370	200
Modified Polystyrenes	650	300	Cellulose Propionate	450	300	Alkyds	350	300
Methylstyrene-Acrylonitrile	610	—	Diallyl Phthalate	450	275	Polycrystalline Glass	350	250
Cellulose Acetate	600	250	Phenolics (cast), GP Decorative	450	300	Phenolics, Ht Res	350	100
Cellulose Nitrate	600	300	Melamines, Elec	430	350	Melamines, GP	330	310
CFE Fluorocarbons	600	530	Phenolics (molded), GP	425	200	ABS Resins, Extra High Impact	312	—
Hard Rubber	600	344	Polystyrenes, Glass-Filled	425	340	Alumina Ceramics	300	200
Mica, Glass-Bonded	600	270	ABS Resins, High Impact	416	350	Standard Electrical Ceramics	300	55
Polyvinyl Formal	600	400	Cellulose Acetate Butyrate	400	250	Zircon	290	60
Polyesters (cast), Rigid	570	340	Chlorinated Polyether	400	—	Steatite	280	145
Epoxies (cast)	550	350	Melamines, Cellulose Elec	400	350	Forsterite	250	—
Polystyrenes, GP	>500	—	Phenolics (cast), Mech & Chem	400	350	Phenolics (cast), GP Transparent	250	75
Acetal	500	—	Polycarbonate	400	—	Cordierite	230	140
Acrylics	500	400	Polyesters (cast), Nonrigid	400	220	Polyethylene Foam, Flexible	220	—
Ethyl Cellulose	500	350						
Nylon, Glass-Filled	500	400						

[a] Values represent high and low sides of a range of *typical* values.

Dielectric Constant of Nonmetallics[a]

Material	High	Low	Material	High	Low	Material	High	Low
Mica, Glass-Bonded	40	6.9	Borosilicate Glass	5.1	4	Modified Polystyrenes, Extra High Impact	3.3	1.9
Phenolics (cast)	11	4	Silicones (molded)	5.1	3.6	Polyvinyl Butyral	3.3	—
Alumina Ceramics	9.6	8.2	Alkyds, GP	5	4.8	Acrylics	3.2	2.7
Lead Silicate Glass	9.5	6.6	Rubber Phenolics	5	—	Polyvinyl Formal	3	—
Zircon	9.2	5.3	Vinylidene Chloride	5	3	Polycarbonate	2.96	—
Polyvinyl Chloride	9.1	2.3	Hard Rubber	4.95	2.90	Methylstyrene-Acrylonitrile	2.81	—
Micas, Natural & Synthetic	8.7	5.4	Polyesters (cast), Allyl Type	4.8	3.3	Chlorinated Polyether	2.8	—
Phenolics (molded)	8	4	Alkyds, Elec & Impact	4.5	4.2	Epoxies, Resilient	2.8	2.6
Soda-Lime Glass	7.4	7.2	Diallyl Phthalate	4.5	3.3	Polystyrenes, GP	2.65	2.45
Melamines	7.2	4.7	Nylons 6 & 11	4.5	3.5	Polymethylstyrene	2.48	—
Cellulose Acetate	7	3.2	Epoxies (cast)	4.4	2.6	CFE Fluorocarbons	2.37	2.30
Standard Electrical Ceramics	7.0	5.4	Epoxies, GP	4.4	3.4	Polyethylenes	2.3	—
Ureas	6.9	6.4	Boron Nitride	4.2	—	Polypropylene	2.1	2
Plastics Laminates, High Pressure	6.8	3.3	ABS Resins, Low Temp Impact	4.1	2.8	TFE Fluorocarbons	2	—
Forsterite	6.5	6.2	Epoxies, Ht Res	4	3.5	Prefoamed Epoxy, Rigid	1.55	1.19
Steatite	6.5	5.5	Modified Polystyrenes	4	2.5	Polyethylene Foam, Flexible	1.49	—
Cellulose Nitrate	6.4	—	Polyesters (cast), Rigid	4	2.8	Urethane Rubber Foamed-in-Place, Rigid	1.40	1.05
Aluminum Silicate Glass	6.3	—	Nylon, Glass-Filled	3.9	3.4	Silicone Foams, Rigid	1.26	1.23
Cellulose Acetate Butyrate	6.2	3.2	Silica Glass	3.8	—	Polystyrene Foamed-in-Place, Rigid	1.19	—
Cordierite	6.2	4	ABS Resins, Extra High Impact	3.78	—	Prefoamed Cellulose Acetate, Rigid	1.12	1.10
Polyesters (cast), Nonrigid	6.1	3.7	Acetal	3.7	—	Prefoamed Polystyrene, Rigid	<1.07	—
Plastics Laminates, Low Pressure	5.6	3.4	ABS Resins, High Impact	3.6	2.8			
Polycrystalline Glass	5.6	—	Cellulose Propionate	3.6	3.4			
			Ethyl Cellulose	3.6	2.8			
			Nylons 66 & 610	3.6	3.4			
			Polystyrenes, Glass-Filled	3.41	2.74			

[a] Values represent high and low sides of a range of *typical* values at 10^6 cycles.

Melting Points of Metals and Ceramics*

Fahrenheit

Material	High	Low	Material	High	Low	Material	High	Low
Tungsten	6152	—	Carbon Steels	2775	2700	Phosphor Bronzes	1970	1550
Thoria	6000	—	Low Alloy Steels	2760	2600	Gilding, 95%	1950	1920
Tantalum	5425	—	Heat Resistant Alloys (cast)	2750	2350	Gold	1945	—
Magnesia	5070	—	High Temperature Steels	2750	2660	Aluminum Bronzes (cast)	1937	1880
Osmium	4890	—	Stainless Steels (cast)	2750	2550	Commercial Bronze	1910	1870
Molybdenum	4760	—	Wrought Irons	2750	—	Leaded Brasses	1900	1610
Calcia & Zirconia	4710	—	Cobalt	2723	—	Tin Bronzes (cast), Leaded	1830	1570
Beryllia	4620	—	Cr-Ni-Fe Superalloys	2664	2225	Beryllium Copper	1800	1600
Ruthenium	4530	—	Austenitic Stainless Steels	2650	2500	Tin Bronzes (cast), High Leaded	1800	1700
Iridium	4450	—	Nickel & Its Alloys	2635	2300	Tin & Aluminum Brasses	1780	1590
Columbium	4379	—	Low Expansion Nickel Alloys	2606	2600	Silver	1761	—
Molybdenum Disilicide	3775	3595	Nickel-Base Superalloys	2600	2318	Aluminum Silicate Glass	1675	—
Rhodium	3571	—	Cobalt-Base Superalloys	2570	1600	Borosilicate Glass	1500	1300
Silicon Nitride	3452	—	Age Hardenable Stainless Steels	2550	2500	Soda-Lime Glass	1330	1285
Hafnium	3400	—	Cr-Ni-Co-Fe Superalloys	2470	2350	Aluminum & Its Alloys	1215	935
Alumina Cermets	3362	—	Beryllium	2341	—	Magnesium Alloys	1200	830
Zirconium & Its Alloys	3355	3300	Cupro-Nickels	2260	2020	Aluminum & Its Alloys (cast)	1195	910
Platinum	3224	—	Austenitic Nodular Irons	2250	—	Lead Silicate Glasses	1160	1075
Thorium	3180	—	Chromium Copper	2147	—	Tin-Lead-Antimony Alloys	792	358
Titanium & Its Alloys	3135	2730	Uranium	2071	—	Zinc & Its Alloys	792	727
Vanadium	3110	—	Heat Resistant Nodular Irons	2150	2050	Soft Lead	623	617
Fused Silica Glass	3050	—	Nickel Silvers	2030	1870	Hard Lead Alloys	610	490
Boron Nitride	>3000	—	Silicon Bronzes	1990	1780	Pewter	565	475
Palladium	2829	—	Coppers	1981	1949	Lead-Base Babbitts	540	460
Martensitic Stainless Steels	2800	2500				White Metal	475	—
96% Silica Glass	2800	—				Hard Tin	443	—
Ferritic Stainless Steels	2790	2600						

*Values represent high and low sides of a range of *typical* values.

Maximum Service Temperatures of Plastics and Rubber*

Fahrenheit

Material	High	Low	Material	High	Low	Material	High	Low
Silicones (molded)	>700	>600	Prefoamed Cellulose Acetate, Rigid	350	200	Butadiene-Acrylonitrile Foams	210	—
TFE Film	585	566	Alkyds, GP	345	295	Rubber Hydrochloride Film	205	—
Silicone Rubber	550	—	Alkyds, Elec	300	—	Acrylics	200	140
Plastics Laminates, Low Pressure	500	250	Allyls (cast)	300	—	Polystyrenes, Glass-Filled	200	190
TFE Fluorocarbons	500	—	Butyl Rubber	300	—	PVC-Nitrile Rubber Blend Film	200	—
Polyester Film	490	—	Diallyl Phthalate, Orlon-Filled	300	—	Urethane Foams, Flexible	200	—
Diallyl Phthalate	450	300	Nylons 66 & 610	300	225	Modified Polystyrenes	190	120
Fluorinated Acrylic Rubber	450	—	Phenolic Foamed-in-Place, Rigid	300	—	Acetal	185	—
Phenolics, Shock & Ht Res	450	250	Polypropylene Film	300	—	Polystyrene Foamed-in-Place, Rigid	185	—
Viton Rubber	450	—	Rubber Phenolics	300	212	Natural Rubber	180	—
Cellulosic Films	400	140	Plastics Laminates, GP	295	245	Neoprene Foams	180	—
Epoxies (cast), Ht Res	400	—	Polyester (cast), Rigid	295	245	Polystyrenes, GP	180	140
FEP Fluorocarbons	400	—	Polyvinylidene Chloride Film	290	—	Polyvinyl Chloride Film, Nonrigid	180	150
Melamines, Glass-Filled	400	300	Melamines, Fabric-Filled	250	—	Styrene-Butadiene Rubber	180	—
Nylon, Glass-Filled	400	300	Melamines, Shock Res	250	—	Epoxies (cast), GP	175	—
Phenolics (molded), Shock & Heat	400	350	Nitrile Rubber	250	—	Prefoamed Polystyrene, Rigid	175	155
Plastics Laminates, Elec	400	160	Nylons 6 & 11	250	200	Polyvinyl Formal	165	130
Urethane Foamed-in-Place, Rigid	400	—	Polyethylene Film	250	200	Butadiene-Styrene Foams	160	—
CFE Film	395	300	Polysulfide Rubber	250	—	Natural Rubber Foam	160	—
Melamines, Cellulose or Mineral-Filled	395	205	Neoprene Rubber	240	—	Cellulose Nitrate	140	120
CFE Fluorocarbons	380	—	Urethane Rubber	240	—	Epoxies (cast), Resilient	122	—
Nylon 6 Film	380	—	Polyvinyl Chloride	220	140	Polyvinyl Butyral	115	—
Alkyds, High Str	350	—	Methylstyrenes	212	210			
Phenolics (molded), GP	350	300	Vinylidene Chloride	212	170			
			Melamines, GP	210	—			

* Values represent high and low sides of a range of *typical* values.

Specific Heat*

Btu/lb/°F

Material ↓	High	Low	Material ↓	High	Low
Nylon 6 & 11	0.6	0.4	Low Expansion Nickel Alloys	0.123	0.120
Allyl (cast)	0.56	0.26	Austenitic Stainless Steels	0.12	—
Polyester, Rigid	0.56	0.30	Cobalt-Base Superalloys	0.12	0.09
Polyethylenes	0.55	0.46	Ferritic Stainless Steels	0.12	0.11
Nylon 66 & 610	0.5	0.3	Low Alloy Steels	0.12	0.10
Polypropylene	0.46	—	Nitriding Steels	0.12	0.11
Beryllium	0.45	—	Vanadium	0.12	—
Cellulose Acetate	0.42	0.3	Carbon Steels	0.11	0.10
Cellulose Acetate Butyrate	0.4	0.3	Cr-Ni-Fe Superalloys	0.11	0.10
Cellulose Propionate	0.4	0.3	Free-Cutting Steels	0.11	0.10
Phenolics, GP	0.40	0.36	Low Alloy Steels (cast)	0.11	0.10
Polyvinyl Butyral	0.4	—	Martensitic Stainless Steels	0.11	—
ABS Resins	0.38	0.35	Nickel-Base Superalloys	0.11	0.09
Acetal	0.35	—	Wrought Irons	0.11	—
Acrylics	0.35	0.34	Inconel	0.109	—
Modified Polystyrenes	0.35	0.30	Cr-Ni-Co-Fe Superalloys	0.108	0.10
Nylon, Glass-Filled	0.35	0.30	Beryllium Copper	0.10	—
Phenolics, High Shock	0.35	0.31	Copper Alloys	0.10	0.09
Polystyrene, GP	0.35	0.33	Nickel & Its Alloys	0.10	0.13
Rubber Phenolics	0.33	—	Zinc & Its Alloys	0.10	0.95
Silicon Carbide	0.33	0.29	Cupro-Nickels	0.09	—
Phenolics, Very High Shock	0.32	0.28	Leaded Brasses	0.09	—
Vinylidene Chloride	0.32	—	Nickel Silvers	0.09	—
Polyvinyl Alcohol	0.3	—	Phosphor Bronzes	0.09	—
Polystyrenes, Glass-Filled	0.27	0.24	Plain Brasses	0.09	—
Prefoamed Polystyrene, Rigid	0.27	—	Silicon Bronzes	0.09	—
Micas	0.25	0.13	Tin & Aluminum Brasses	0.09	—
TFE Fluorocarbons	0.25	—	Zircon & Its Alloys	0.07	—
Magnesium Alloys	0.245	—	Columbium	0.065	—
Aluminum & Its Alloys	0.23	0.22	Molybdenum	0.65	—
CFE Fluorocarbons	0.22	—	Tin-Lead-Antimony Alloys	0.065	—
Borosilicate Glass	0.2	—	Rhodium	0.059	—
Soda-Lime Glass	0.2	—	Palladium	0.058	—
Fused Silica Glass	0.19	—	Ruthenium	0.057	—
Polycrystalline Glass	0.19	0.18	Silver	0.056	—
Aluminum Silicate Glass	0.18	—	Tin & Its Alloys	0.05	—
Carbon	0.18	—	Tantalum	0.036	—
Graphite	0.18	—	Hafnium	0.035	—
96% Silica Glass	0.18	—	Tungsten	0.034	—
Lead Silicate Glass	0.17	0.16	Lead & Its Alloys	0.032	0.031
Alumina Cermets	0.16	0.14	Gold	0.031	—
Heat Resistant Alloys (cast)	0.14	0.11	Iridium	0.031	—
Stainless Steels (cast)	0.14	0.11	Osmium	0.031	—
Malleable Irons	0.13	—	Platinum	0.031	—
Titanium & Its Alloys	0.13	0.12	Thorium	0.03	—
Monel	0.127	—	Uranium	0.03	—

* Values represent high and low sides of a range of *typical* values.

Modulus of Elasticity in Tension[a]

100,000 psi

Material	High	Low	Material	High	Low
Tungsten Carbide Cermet	943	616	Tellurium Copper	160	—
Tungsten-Titanium Carbide Cermet	806	655	Tin & Aluminum Brasses	160	150
Osmium	800	—	Zirconium & Its Alloys	140	138
Iridium	740	—	Aluminum Silicate Glass	127	—
Silicon Carbide	680	132	Boron Nitride	124	—
Ruthenium	600	—	Gold	120	—
Titanium Carbide Cermet	570	420	Mica, Glass-Bonded	120	70
Alumina Ceramics	500	320	Silver	110	—
Tungsten	500	—	Aluminum & Its Alloys	106	100
Beryllium	440	—	Fused Silica Glass	102	—
Boron Carbide	420	—	Soda-Lime Glass	100	90
Molybdenum	420	—	Standard Electrical Ceramics	100	—
Rhodium	420	—	Thorium	100	—
Alumina Cermets	410	370	Borosilicate Glass	98	68
Cobalt-Base Superalloys	360	270	96% Silica Glass	97	—
High Temperature Steels	316	290	Lead Silicate Glass	90	76
Cr-Ni-Co-Fe Superalloys	311	288	Pewter	77	—
Inconel	310	—	Tin-Base Babbitts	76	72
Carbon Steels	300	290	Cordierite	70	—
Cobalt (cast)	300	—	Grade A Tin	65	60
Low Alloy Steels (cast)	300	290	Magnesium Alloys	65	64
Mica, Natural	300	200	Phenolics, Elec	50	30
Nickel & Its Alloys	300	190	Lead-Base Babbitts	42	—
Nitriding Steels	300	290	Nickel-Base Superalloys	35.5	28
Ultra High Strength Steels	300	294	Phenolics, Shock & Ht Res	33	8
Uranium	300	—	Lead & Its Alloys	20	15
Cr-Ni-Fe Superalloys	299	280	Melamines, Filled	19.5	9.9
Wrought Irons	295	—	Titanium & Its Alloys	17.5	13
Age Hardenable Stainless Steels	294	280	Ureas	16	13
Austenitic Stainless Steels	290	280	Phenolics, GP	13	7
Ferritic Stainless Steels	290	—	Polystyrenes, Glass-Filled	13	11
Free-Cutting Steels	290	—	Tin Bronzes (cast), High Leaded	13	8.5
Heat Resistant Alloys (cast)	290	250	Diallyl Phthalate	12	6
Martensitic Stainless Steels	290	—	Rubber Phenolics	9	3
Stainless Steels (cast)	290	240	Nylon, Glass-Filled	8.6	1.2
Pearlitic Malleable Irons	280	—	Polyvinyl Formal	7	5
Tantalum	270	—	Modified Polystyrenes	6	2.5
Monel	260	—	Acrylics, GP	5	3.5
Mica, Synthetic	250	—	Phenolics (cast), Mech & Chem	5	4
Standard Nodular or Ductile Irons	250	185	Polystyrenes, GP	5	4
Standard Malleable Irons	250	—	Phenolics (cast), Decorative	4.5	3
Low Expansion Nickel Alloys	240	210	Nylon 66 & 610	4.1	1.6
Cupro-Nickels	220	180	Polyvinyl Butyral	4	3.5
Platinum	210	—	Nylon 6 & 11	3.6	1.5
Zircon	210	—	Ethyl Cellulose	3.5	0.5
Gray Irons	200	90	Acrylics, High Impact	3	2.2
Hafnium & Vanadium	200	—	Allyls (cast)	3	2
Austenitic Nodular Irons	185	—	CFE Fluorocarbons	3	1.9
Aluminum Bronzes (cast)	180	150	Phenolics (cast), Transparent	3	1
Nickel Silvers	180	175	ABS Resins	2.9	1
Silicon Bronzes	180	150	Carbon	2.3	1.6
Polycrystalline Glass	173	125	Cellulose Nitrate	2.2	1.9
Copper	170	—	Vinylidene Chloride	2	0.7
Gilding, 95% & Commercial Bronze, 90%	170	—	Graphite	1.8	0.5
Leaded Brasses	170	140	Polypropylene	1.55	—
Palladium	170	—	TFE Fluorocarbons	0.65	0.38
Phosphor Bronzes	170	150	Polycarbonate	0.33	—
Steatite	160	130	Polyethylene, Low Density	0.27	0.20
			Polyvinyl Chloride, Nonrigid	0.030	0.004

[a] Values represent high and low sides of a range of *typical* values at room temperature.

Yield Strength of Metals*

1000 psi

Material ⬇	High	Low	Material ⬇	High	Low
Martensitic Stainless Steels, H & T	275	60	Austenitic Stainless Steels, Ann.	55	30
Ultra High Strength Steels, H & T	250	239	Beryllium, Ann.	55	45
Low Alloy Steels (40XX), H & T	231	85	Chromium Copper, Hard	55	—
Low Alloy Steels (92XX), H & T	226	215	Ferritic Stainless Steels, Ann.	55	35
Age Hardenable Stainless Steels, Sol'n Tr & Aged	225	42	Commercial Bronze, 90%, Hard	54	—
Titanium & Its Alloys, Ht Tr	220	150	Naval Brass, Half Hard	53	—
Low Alloy Steels (41XX), H & T	215	170	Free-Cutting Brass, Half Hard	52	—
Low Alloy Steels (51XX), H & T	208	114	Aluminum & Its Alloys, Hard	50	22
Nitriding Steels, H & T	202	90	Gilding, 95%, Hard	50	—
Low Alloy Steels (43XX), H & T	200	154	Leaded Commercial Bronze, Half Hard	50	—
Low Alloy Steels (86XX, 87XX), H & T	194	98	Sulfur Copper, Half Hard	48	—
High Temperature Steels, H & T	186	117	Aluminum Bronzes (cast)	45	27
Low Alloy Steels (61XX), H & T	179	94	Copper, Hard	45	—
Low Alloy Steels (cast)	170	45	Thorium, CW	45	—
Stainless Steels (cast), H & T	165	67	Zirconium & Its Alloys, Ann.	45	11
Low Alloy Steels (46XX), H & T	160	75	Magnesium Alloys	44	19
Titanium & Its Alloys, Ann.	160	40	Silver, CW	44	—
Nickel-Base Superalloys, Sol'n Tr & Aged	154	92	Tellurium Copper, Half Hard	44	—
Beryllium-Copper, Hard	150	130	Cobalt (cast)	43	20
Carbon Steels, H & T	142	86	Aluminum & Its Alloys (cast), Sol'n Tr & Aged	42	20
Cr-Ni-Fe Superalloys, Sol'n Tr & Aged	142	71	Low Expansion Nickel Alloys, Ann.	40	33
Austenitic Stainless Steels, CW	140	75	Nickel Brasses & Bronzes (cast), Leaded	40	15
Nodular Irons	125	45	Standard Malleable Irons	40	32
Nickel-Base Superalloys (cast)	120	105	Austenitic Nodular Irons	38	32
Nickel & Its Alloys, Ann. & Age Hard	120	90	Beryllium-Copper, Ann.	35	25
Low Alloy Steels (13XX), H & T	118	100	Hafnium, Ann.	32	—
Cobalt-Base Superalloys, Sol'n Tr & Aged	113	67	Gold, CW	30	—
Martensitic Stainless Steels, Ann.	105	25	Magnesium Alloys (cast)	30	8
Free-Cutting Steels, CD	100	60	Nickel Silvers, Ann.	30	18
Low Alloy Steels (25XX), H & T	100	94	Palladium, CW	30	—
Pearlitic Malleable Irons	100	45	Tin & Aluminum Brasses, Ann.	30	22
Zirconium & Its Alloys, CW	98	58	Phosphor Bronzes, Ann.	28	14
Hafnium, CW	96	—	Platinum, CW	27	—
Heat Resistant Nodular Irons	95	45	Wrought Irons, HR	27	—
Cr-Ni-Co-Fe Superalloys, Sol'n Tr & Aged	91	58	Aluminum & Its Alloys (cast)	26	8
Nickel Silvers, Hard	90	74	Tin Bronzes (cast), Leaded	26	16
Yellow Brasses (cast), High Strength	90	25	Thorium, Ann.	26	—
Silicon Bronzes, Hard	88	50	Uranium, Ann.	25	—
Stainless Steels (cast)	85	31	Red Brasses (cast), Leaded	24	12
Carbon Steels, HR	84	29	Aluminum & Its Alloys, Ann.	23	4
Heat Resistant Alloys (cast), Ht Tr	81	43	Cupro-Nickels, Ann.	22	15
Ferritic Stainless Steels, CW	80	45	Tin Bronzes (cast), High Leaded	22	11
Carbon Steels, CW	79	33	Muntz Metal, Ann.	21	—
Phosphor Bronzes, Hard	75	50	Architectural Bronze (extr)	20	—
Zirconium Copper, Hard	75	48	Forging Brass (extr)	20	—
Aluminum & Its Alloys, Sol'n Tr & Aged	73	31	Leaded Brasses, Ann.	20	17
Cupro-Nickels, Hard	73	—	Yellow Brasses (cast), Leaded	20	11
Nickel-Base Superalloys, Sol'n Tr	72	52	Ingot Iron, Ann.	19	—
Aluminum Bronzes (cast), Ht Tr	70	40	Free-Cutting Brass, Ann.	18	—
Carbon Steels (cast)	70	30	Chromium Copper, Ann.	15	—
Low Expansion Nickel Alloys, CW	70	—	Yellow Brass, Ann.	14	—
Ingot Iron, CD	69	—	Low Brass, 80%, Ann.	12	—
Nickel & Its Alloys, Ann.	65	12	Cartridge Brass, 70%, Ann.	11	—
Cartridge Brass, 70%, Hard	63	—	Commercial Bronze, 90%, Ann.	10	—
Tin & Aluminum Brasses, Half Hard	60	53	Copper, Ann.	10	—
Leaded Brasses, Hard	60	52	Gilding, 95%, Ann.	10	—
Manganese Bronze (A), Half Hard	60	—	Red Brass, 85%, Ann.	10	—
Silicon Bronzes, Ann.	60	15	Silver, Ann.	8	—
Yellow Brass, Hard	60	—	Tin & Its Alloys, CR	6	2
Low Brass, 80%, Hard	59	—	Platinum, Ann.	5.5	—
Red Brass, 85%, Hard	57	—	Palladium, Ann.	5	—
			Lead & Its Alloys	1.6	0.8
			Tin & Its Alloys, Ann.	1.3	—

* Values represent high and low sides of a range of *typical* values at 0.2% offset.

Tensile Strength*

1000 psi

Material ↓	High	Low	Material ↓	High	Low
Rhodium, CW	300	—	Stainless Steels (cast)	105	69
Tungsten, CW	300	70	Asbestos Fibers	100	80
Ultra High Strength Steels, H & T	295	279	Carbon Steels (cast)	100	60
Martensitic Stainless Steels, H & T	285	90	Columbium, CW	100	—
Low Alloy Steels (40XX), H & T	269	120	Heat Resistant Nodular Irons	100	60
Low Alloy Steels (92XX), H & T	258	232	Silicon Bronzes, Hard	100	70
Age Hardenable Stainless Steels, Sol'n Tr & Aged	240	86	Tantalum, Ann.	100	50
Titanium & Its Alloys, Ht Tr	240	160	Aluminum Bronzes (cast)	95	75
High Temperature Steels, H & T	235	139	Carbon Steels, CW	92	56
Aluminum Silicate Fibers	230	50	Beryllium, Ann.	90	60
Low Alloy Steels (41XX), H & T	230	200	Ferritic Stainless Steels, CW	90	75
Low Alloy Steels (51XX), H & T	224	143	Polyethylene Fibers	90	11
Glass Fibers	220	200	Silicon Bronzes, Ann.	90	40
Low Alloy Steels (43XX), H & T	220	180	Uranium, Ann.	90	—
Stainless Steels (cast), H & T	220	110	Ferritic Stainless Steels, Ann.	85	65
Low Alloy Steels (86XX, 87XX), H & T	214	122	Plastics Laminates, Low Pressure	85	8
Nitriding Steels, H & T	206	121	Tin & Aluminum Brasses, Half Hard	84	75
Nickel-Base Superalloys, Sol'n Tr & Aged	205	162	Aluminum & Its Alloys, Sol'n Tr & Aged	83	35
Low Alloy Steels (cast)	200	70	Animal Fibers	83	20
Cr-Ni-Fe Superalloys, Sol'n Tr & Aged	196	114	Beryllium-Copper, Ann.	80	60
Nickel & Its Alloys, Ann. & Age Hard.	190	130	Cupro-Nickels, Hard & Light Drawn	80	60
Carbon Steels, H & T	189	113	Leaded Brasses, Hard	80	55
Low Alloy Steels (61XX), H & T	187	125	Zirconium Copper, Hard	80	56
Austenitic Stainless Steels, CW	185	110	Hafnium, Ann.	77	—
Beryllium-Copper, Hard	185	165	Low Expansion Nickel Alloys, Ann.	77	68
Low Alloy Steels (46XX), H & T	185	100	Cartridge Brass, 70%, Hard	76	—
Tantalum, CW	180	110	Gray Irons	75	15
Molybdenum, CW	175	120	Low Brass, 80%, Hard	74	—
Titanium & Its Alloys, Ann.	170	110	Yellow Brass, Hard	74	—
Cobalt-Base Superalloys, Sol'n Tr & Aged	165	101	Ingot Iron, CD	73	—
Cellulosic Fibers	155	20	Rhodium, Ann.	73	—
Cr-Ni-Co-Fe Superalloys, Sol'n Tr & Aged	154	118	Vanadium, Ann.	72	—
Nodular Irons	150	60	Red Brass, 85%, Hard	70	—
Nickel & Its Alloys (cast), Ann. & Aged	145	30	Austenitic Nodular Irons	68	58
Tungsten-Titanium Carbide Cermet	145	118	Free-Cutting Brass, Half Hard	68	—
Carbon Steels, HR	142	51	Zirconium & Its Alloys, Ann.	68	29
Low Expansion Nickel Alloys, CW	140	90	Phosphor Bronzes, Ann.	66	40
Low Alloy Steels (13XX), H & T	137	122	Nickel Brasses & Bronzes (cast), Leaded	65	30
Titanium Carbide Cermet	134	26	Tin & Aluminum Brasses, Ann.	65	53
Bast Fibers	132	57	Vanadium, Ann.	64	—
Nickel-Base Superalloys, Sol'n Tr	131	114	Nickel Silvers, Ann.	63	49
Molybdenum, Ann.	130	85	Chromium Copper, Hard	62	—
Nickel-Base Superalloys (cast)	130	117	Commercial Bronze, 90%, Hard	61	—
Phosphor Bronzes, Hard	130	65	Aluminum & Its Alloys, Hard	60	22
Tungsten Carbide Cermet	130	—	Architectural Bronze (extr)	60	—
Nylon Fiber	128	59	Cupro-Nickels, Ann.	60	44
Polyester Fibers	126	67	Leaded Brasses, Ann.	60	49
Hard Fibers	125	100	Standard Malleable Irons	60	52
Martensitic Stainless Steels, Ann.	125	65	Acrylic Fibers	57	26
Low Alloy Steels (25XX), H & T	120	113	Gilding, 95%, Hard	56	—
Nickel & Its Alloys, Ann.	120	50	Copper, Hard	55	50
Pearlitic Malleable Irons	120	65	Leaded Commercial Bronze, Half Hard	55	—
Yellow Brasses (cast), High Strength	120	60	Micas, Natural & Synthetic	55	40
Aluminum Bronzes (cast), Ht Tr	115	90	Magnesium Alloys	55	34
Austenitic Stainless Steels, Ann.	115	80	Muntz Metal, Ann.	54	—
Heat Resistant Alloys (cast), Ht Tr	115	73	Silver, CW	54	—
Vanadium & Hafnium, CW	113	112	Forging Brass (extr)	52	—
Free-Cutting Steels, CD	110	70	Columbium, Ann.	50	—
Heat Resistant Steels (cast)	110	65	Sulfur Copper, Half Hard	50	—
Cotton Fiber	109	44	Aluminum & Its Alloys (cast), Sol'n Tr & Aged	49	36
Vanadium, CW	109	—	Free-Cutting Brass, Ann.	49	—
Zirconium & Its Alloys, CW	108	82	Thorium, CW	49	—
Nickel Silvers, Hard	105	83	Tellurium Copper, Half Hard	48	—
			Tin Bronzes (cast), Leaded	48	33
			Wrought Irons, HR	48	39

* Values represent high and low sides of a range of *typical* values at room temperature.

Tensile Strength*

1000 psi

Material	High	Low
Zinc & Its Alloys (cast)	46	25
Fluorocarbon Fiber	47	—
Palladium, CW	47	—
Red Brasses (cast), Leaded	46	29
Yellow Brass, Ann	46	—
Zinc & Its Alloys, CR	46	21
Aluminum & Its Alloys, Ann	45	12
Platinum, CW	45	34
Vinyl Fibers	45	12
Yellow Brasses (cast), Leaded	45	30
Cartridge Brass, 70%, Ann	44	—
Aluminum & Its Alloys (cast)	43	19
Ingot Iron, Ann	42	—
Low Brass, 80%, Ann	42	—
Zinc & Its Alloys, HR	42	19.5
Magnesium Alloys (cast)	40	23
Vinylidene Chloride	40	4
Alumina Ceramics	39	20
Red Brass, 85%, Ann	39	—
Tin Bronze (cast), High Leaded	38	25
Chromium Carbide Cermet	37	36
Commercial Bronze, 90%, Ann	37	—
Plastic Laminates, High Pressure	37	7
Chromium Copper, Ann	35	—
Copper, Ann	35	32
Cobalt (cast)	34.4	—
Gilding, 95%, Ann	34	—
Thorium, Ann	34	—
Gold, CW	32	—
Nylon, Glass-Filled	31	19
Palladium, Ann	30	—
Polyester Film	28	17
Platinum, Ann	26	17
Silicon Carbide	25	3
Boron Carbide	22.5	—
Silver, Ann	22	—
Alumina Cermets	21	—
Cellophane	19	7
Gold, Ann	19	—
Nylon 6 Film	17	13.8
Polystyrenes, Glass-Filled	17	11
Polyvinylidene Chloride Film	15	7
Steatite	15	4.8
Nylon 66 & 610	12.6	7.1
Epoxies (cast)	12	0.1
Nylon 6 & 11	12	8.5
Polystyrene Film	12	7
Zircon	12	4.5
Tin-Lead-Antimony Alloys (cast)	11.8	6.8
Modified Polystyrenes	11	3
Polyvinyl Formal	11	9
Acrylics (molded, extr)	10.5	5.5
Polycarbonate	10.5	9
Acetal	10	—
Alkyds, Impact	10	6
Epoxies (molded)	10	8
Ethyl Cellulose Film	10	6
Forsterite	10	—
Melamines	10	5
Phenolics (molded)	10	3.5
Polyesters (cast)	10	0.9
Polyprophylene Film	10	5
Polyvinyl Alcohol Film	10	6
Ureas	10	5
Hard Rubber	9.3	2
Methylstyrenes	9.3	6.6
Phenolics (cast)	9	2.5
Polyvinyl Chloride	9	1
Tin & Its Alloys, CR	8.7	2.8
Tin & Its Alloys, Ann	8.6	2.2
ABS Resins	8.5	3
Cellulose Acetate	8.5	1.9
Polyvinyl Butyral	8.5	4
Polyvinyl Chloride Film, Rigid	8.5	6.5
Acrylics (cast), GP	8	6
Cellulose Nitrate	8	7
Polyethylene Film	8	1.6
Polystyrenes, GP	8	5
Wood Comp Board (par. to sur), Hardboard	7.8	3
Cellulose Propionate	7.5	1.5
Lead & Its Alloys (cast)	7.4	2
Acrylics, High Impact	7.3	5.5
Diallyl Phthalate	7	4
Electrical Ceramics	7	2.5
Ethyl Cellulose	7	3
Mica, Glass-Bonded	7	5
Cellulose Acetate Butyrate	6.8	1.9
CFE Film	6.6	6.3
Chlorinated Polyether	6	—
Rubber Hydrochloride Film	6	5
Urethane Rubber (gum)	>5	—
CFE Fluorocarbons	5.7	4.6
Polyprophylene	5	—
Polyvinyl Alcohol	5	1
Polyvinyl Chloride Film, Nonrigid	5	1
Silicones (molded)	5	4
Wood Comp Board (par. to sur), Particle	5	0.5
Lead & Its Alloys (rolled)	4.7	2.4
Natural Rubber (black)	4.5	3.5
Nitrile Rubber (black)	4.5	3
Polythylene, High Density	4.4	2.9
Alkyds, GP & Elec	4	3
Neoprene Rubber (black)	4	3
PVC-Nitrile Rubber Blend Film	4	1.5
Styrene-Butadiene Rubber (black)	3.5	2.5
TFE Fluorocarbons	3.5	2.5
Lead & Its Alloys (extr)	3.3	2
Butyl Rubber (black)	3	2.5
Cordierite	3	—
TFE Film	3	2
Polyethylene, Medium Density	2.4	2
Viton Rubber (gum)	>2	—
Graphite	2	0.4
Wood Comp Board (par. to sur), Softboard	2	0.2
Fluorinated Acrylic Rubber (gum)	1.2	—
Urethane Foamed-in-Place, Rigid	1.2	0.010
Carbon	1.1	0.9
Polysulfide Rubber (gum)	>1	—
Silicone Rubber (gum)	1	0.6
Polyethylene, Low Density	0.9	2.5
Wool Felts, Sheet	0.8	0.4
Polyethylene Foam, Flexible	0.67	—
Prefoamed Epoxy, Rigid	0.65	0.05
Wool Felts, Roll	0.6	0.08
Vinyl Foams, Flexible	0.2	0.01
Prefoamed Polystyrene, Rigid	0.19	0.030
Prefoamed Cellulose Acetate, Rigid	0.18	0.11
Polystyrene Foamed-in-Place, Rigid	0.13	0.030
Neoprene Foams	0.1	0.02
Butadiene-Styrene Foams	0.08	—
Phenolic Foamed-in-Place, Rigid	0.075	0.004
Butadiene-Acrylonitrile Foams	0.04	—
Natural Rubber Foam	0.020	0.010

* Values represent high and low sides of a range of *typical* values at room temperature.

Elongation*

Percent

Material ↓	High	Low	Material ↓	High	Low
Butyl Rubber (black)	850	650	Free-Cutting Brass, Ann.	53	—
Polyethylene Film	800	50	Low Brass, 80%, Ann.	52	—
Urethane Rubber (gum)	750	540	Magnesium Alloys (cast), Sol'n Tr & Aged	51	—
Polyethylene, Low Density	725	80	Thorium, Ann.	51	—
Polypropylene	700	500	Beryllium-Copper, Ann.	50	35
Natural Rubber (black)	650	550	Cellophane	50	15
Nitrile Rubber (black)	650	450	Monel, Ann.	50	24
Polysulfide Rubber (gum)	650	450	Nickel-Base Superalloys, Sol'n Tr	50	43
Neoprene Rubber (black)	600	500	Nickel Silvers, Ann.	50	32
Polyvinyl Alcohol	600	300	Pewter, CR	50	—
Styrene-Butadiene Rubber (black)	600	500	Zinc Alloys, HR	50	10
Polyvinyl Chloride Film, Nonrigid	500	50	Zinc, CR	50	30
PVC-Nitrile Rubber Blend Film	500	250	Cr-Ni-Co-Fe Superalloys, Sol'n Tr & Aged	49	3
Rubber Hydrochloride Film	500	350	Low Expansion Nickel Alloys, Ann.	49	43
Polyvinyl Chloride	450	5	Monel (cast)	49	1
Polyethylene, Medium Density	425	200	Ingot Iron, Ann.	48	—
Polyethylene, High Density	400	12	Red Brass, 85%, Ann.	48	—
Silicone Rubber (gum)	400	60	Silver, Ann.	48	—
Natural Rubber Foam	380	—	Naval Brass, Ann.	47	—
Viton Rubber (gum)	>350	—	Soft Leads (chill cast)	47	39
TFE Fluorocarbons	350	250	Age Hardenable Stainless Steels, Sol'n Tr & Aged	45	3
Nylon 66 & 610	320	60	Aluminum & Its Alloys, Ann.	45	17
Polyesters (cast), Nonrigid	310	30	Commercial Bronze, 90%, Ann.	45	—
Polyethylene Foam, Flexible	310	—	Copper, Ann.	45	35
Fluorinated Acrylic Rubber (gum)	300	—	Cupro-Nickels, Ann.	45	27
Nylon 6 & 11	300	100	Cupro-Nickels, Light Drawn	45	42
Vinyl Foams, Flexible	300	75	Forging Brass (extr)	45	—
TFE Film	250	200	Gilding, 95%, Ann.	45	—
Nylon 6 Film	>200	—	Gold, Ann.	45	—
Polypropylene Film	>200	—	Grade A Tin, Ann.	45	—
ABS Resins	200	5	Modified Polystyrenes	45	1
CFE Film	200	90	Muntz Metal, Ann.	45	—
CFE Fluorocarbons	175	125	Nickel & Its Alloys (cast)	45	1
Chlorinated Polyether	160	60	Acrylic Fibers	42	20
Epoxies (cast)	150	2	Molybdenum, Ann.	42	4
Nickel & Its Alloys, Ann.	130	25	Nylon Fiber	42	16
Polyester Film	130	70	Sulfur Copper, Ann.	42	—
Vinyl Fibers	120	15	Cr-Ni-Fe Superalloys, Sol'n Tr & Aged	41	16
Polycarbonate	100	60	Austenitic Nodular Irons	40	7
Polyethylene Fibers	80	—	Chromium Copper, Ann.	40	—
Lead & Its Alloys (extr)	75	48	Palladium, Ann.	40	24
Cellulose Acetate Butyrate	74	38	Pewter, Ann.	40	—
Cellulose Acetate	70	6	Platinum, Ann.	40	30
Cellulosic Films	70	15	Polyvinylidene Chloride Film	40	25
Phosphor Bronzes, Ann.	70	48	Silicon Bronzes, Hard	40	15
White Metal, Ann.	70	—	Tantalum, Ann.	40	11
Cartridge Brass, 70%, Ann.	66	—	Tin Bronzes (cast), Leaded	40	15
Admiralty Brass, Ann.	65	—	Tin Foil, CR	40	—
Yellow Brass, Ann.	65	—	Yellow Brasses (cast), Leaded	40	15
Zinc & Its Alloys, HR	65	10	Carbon Steels, HR	39	9
Cobalt-Base Superalloys, Sol'n Tr & Aged	64	2	Wool Felts (at 100 psi), Roll	39	8
Silicon Bronzes, Ann.	63	20	Polyester Fibers	36	9
Titanium Carbide Cermet	61	0	Aluminum Bronzes (cast)	35	7
Austenitic Stainless Steels, Ann.	60	45	Animal Fibers	35	13
Austenitic Stainless Steels, CW	60	8	Carbon Steels, CW	35	20
Cellulose Propionate	60	50	Ethyl Cellulose Film	35	20
Hard Lead (rolled)	60	16	Grade A Tin, CR	35	—
Polyvinyl Butyral	60	5	Heat Resistant Alloys (cast)	35	4
Zinc & Its Alloys, CR	60	10	Martensitic Stainless Steels, Ann.	35	14
Soft Leads (rolled)	57	43	Red Brasses (cast), Leaded	35	15
Grade A Tin (cast)	55	—	Yellow Brasses (cast), High Strength	35	12
Leaded Brasses, Ann.	55	30			
Stainless Steels (cast)	55	15			

* Values represent high and low sides of a range of *typical* values at room temperature.

Elongation[a]

Percent

Material	High	Low	Material	High	Low
Cellulosic Fibers	34	6	Wrought Irons, HR	14	2
Hard Rubber	33	1	Fluorocarbon Fiber	13	—
Manganese Bronze (A), Ann.	33	—	Low Alloy Steels (51XX), H & T	13	—
Carbon Steels (cast)	32	20	Phosphor Bronzes, Hard	13	8
Architectural Bronze (extr)	30	—	Uranium, Ann.	13	—
Cobalt (cast)	30	4	Beryllium-Copper, Hard	12	3
Columbium, Ann.	30	—	Chromium Copper, Hard	12	—
Ferritic Stainless Steels, Ann.	30	20	Ingot Iron, CD	12	—
Martensitic Stainless Steels, H & T	30	2	Leaded Commercial Bronze, Half Hard	12	—
Nickel Brasses & Bronzes (cast), Leaded	30	10	Low Alloy Steels (40XX), H & T	12	8
Soft Leads (sand cast)	30	—	Magnesium Alloys (cast), Sol'n Tr	12	10
Stainless Steels (cast), H & T	30	1	Sulfur Copper, Half Hard	12	—
Vinylidene Chloride	30	15	Tellurium Copper, Half Hard	12	—
Vanadium, Ann.	28	—	Titanium & Its Alloys, Ht Tr	12	3
White Metal, CR	28	—	Ultra High Strength Steels, H & T	12	5.5
Wool Felts (at 100 psi), Sheet	28	2	Aluminum & Its Alloys (cast), Sol'n Tr & Aged	10	0.5
Zinc Alloys, CR	28	—	Hafnium, CW	10	—
Zirconium & Its Alloys, Ann.	27	22	Low Alloy Steels (92XX), H & T	10	9
Low Alloy Steels (cast)	26	5	Polystyrene Film	10	3
Acrylics (molded, extr)	>25	3	Zinc & Its Alloys (cast)	10	1
Ferritic Stainless Steels, CW	25	15	Zirconium & Its Alloys, CW	10	1.5
High Alloy Steels (cast), Ht Tr	25	4	Copper, Hard	10	1.5
Low Alloy Steels (25XX), H & T	25	22	Monel, Age H	10	5
Malleable Irons	25	2	Aluminum & Its Alloys (cast)	9	2
Nickel-Base Superalloys, Sol'n Tr & Aged	25	14	Cartridge Brass, 70%, Hard	8	—
Nickel & Its Alloys, Ann. & Age Hard	25	10	Yellow Brass, Hard	8	—
Nodular Irons	25	2	Hard Fibers	7.5	1
Polypropylene Fiber	25	12	Low Brass, 80%, Hard	7	—
Polyvinyl Chloride Film, Rigid	25	5	Cotton Fiber	7	3
Standard Malleable Irons	25	10	Acrylics (cast), GP	7	2
Titanium & Its Alloys, Ann.	25	10	Nickel-Base Superalloys (cast)	6	5
Zirconium Copper, Hard	25	5	Bast Fibers	6	3
Hafnium, Ann.	24	—	Cupro-Nickels, Hard	6	—
Hard Lead Alloys (chill cast)	24	16	Beryllium, Ann.	5	2
Monel, Ann. & Age H	24	14	Columbium, CW	5	—
Carbon Steels, H & T	23	11	Commercial Bronze, 90%, Hard	5	—
Nitriding Steels, H & T	23	15	Gilding, 95%, Hard	5	—
Aluminum & Its Alloys, Sol'n Tr & Aged	22	11	Nickel Silvers, Hard	5	3
Free-Cutting Steels, CD	22	10	Methylstyrenes	5	2.5
Tin-Base Babbitts (die cast)	22	4	Polyesters (cast), Rigid	5	—
Low Alloy Steels (61XX), H & T	21	13	Red Brass, 85%, Hard	5	—
Low Alloys Steels (86XX, 87XX), H & T	21	12	Gold, CW	4	—
Heat Resistant Nodular Irons	20	0	Hard Rubber, GP	4	2
Low Alloy Steels (13XX), H & T	20	19	Nickel & Its Alloys (cast), Ann. & Aged	4	1
Low Expansion Nickel Alloys, CW	20	—	Phosphor Bronzes, Spring	4	3
Naval Brass, Half Hard	20	—	Glass Fibers	3.8	2
Polyvinyl Formal	20	5	Platinum, CW	3.5	2.5
Tin Bronzes (cast), High Leaded	20	7	Vanadium, CW	3	—
Inconel (cast)	19	1	Aluminum Silicate Fibers	2.7	1.4
Manganese Bronze (A), Half Hard	19	—	Hard Rubber, Chem & High Ht Res	2.6	—
Magnesium Alloys (cast)	19	3	Silver, CW	2.5	—
Free-Cutting Brass, Half Hard	18	—	Polystyrenes, GP	2.4	1.5
Leaded Brasses, Hard	18	6	Nylon, Glass-Filled	2.3	1.5
Low Alloy Steels (46XX), H & T	18	14	Phenolics (molded)	2.25	0.10
Low Alloy Steels (48XX), H & T	18	13	Palladium, CW	1.5	—
High Temperature Steels, H & T	16.5	8	Tantalum, CW	1.5	1
Low Alloy Steels (41XX), H & T	16	10	Polystyrenes, Glass-Filled	1.3	1.1
Pearlitic Malleable Irons	16	2	Molybdenum, CW	1	—
Acetal	15	—	Ureas	1	—
Aluminum Bronzes (cast), Ht Tr	15	5	Melamines	0.8	0.3
Aluminum & Its Alloys, Hard	15	1.5	Cobalt	0.4	—
Low Alloy Steels (43XX), H & T	15	12	Chromium Carbide Cermet	0	—
Magnesium Alloys (forged)	15	7	Tungsten, CW	0	—

[a] Values represent high and low sides of a range of *typical* values at room temperature.

Hardness of Metals*

Brinell

Material	High	Low	Material	High	Low
Martensitic Stainless Steels, H & T	580	180	Standard Malleable Irons	156	110
Low Alloy Steels (40XX), H & T	534	415	Cartridge Brass, 70%, Hard	154	—
Low Alloy Steels (92XX), H & T	514	477	Muntz Metal, Hard	151	—
Stainless Steels (cast), H & T	470	185	Aluminum & Its Alloys, Sol'n Tr & Aged	150	73
Low Alloy Steels (43XX), H & T	445	360	Naval Brass, Hard	150	130
Low Alloy Steels (61XX), H & T	444	429	Nickel Brasses & Bronzes (cast), Leaded	150	50
Low Alloy Steels (51XX), H & T	444	302	Standard Malleable Irons	147	103
Low Alloy Steels (41XX), H & T	444	375	Low Expansion Nickel Alloys, Ann	144	132
Low Alloy Steels (86XX, 87XX), H & T	423	245	Ingot Iron, CD	142	—
Nitriding Steels, H & T	415	230	Low Carbon Steels, HR	141	119
Low Alloy Steels (cast)	400	150	Aluminum & Its Alloys (cast), Sol'n Tr & Aged	140	80
High Carbon Steels, H & T	390	310	Yellow Brass, Hard	140	—
Low Alloy Steels (46XX), H & T	390	—	Cobalt, Ann	138	122
Rhodium, CW	390	260	Cobalt (cast)	135	105
Duranickel, Age H	380	300	Low Brass, 80%, Hard	130	—
Low Alloy Steels (48XX), H & T	380	325	Red Brass, 85%, Hard	126	—
Nickel & Its Alloys (cast)	380	80	Palladium, CW	109	—
Nickel & Its Alloys (cast), Ann. & Aged	380	300	Commercial Bronze, 90%, Hard	107	—
Iridium, CW	350	—	Aluminum & Its Alloys, Hard	105	44
Monel, Age H	350	290	Gilding, 95%, Hard	105	—
Osmium (cast)	350	—	Wrought Irons, HR	105	97
Nodular Irons	325	140	Platinum, CW	97	13
Gray Irons	300	170	Zinc Alloys (die cast)	90	82
Heat Resistant Nodular Irons	300	140	Aluminum & Its Alloys (cast)	85	40
High Carbon Steels, HR	289	231	Magnesium Alloys (cast), Sol'n Tr & Aged	84	73
Low Alloy Steels (13XX), H & T	285	248	Muntz Metal, Ann	82	—
Pearlitic Malleable Irons	285	160	Zinc Alloys, CR	80	60
Nickel Steels, CD	272	188	Tin Bronzes (cast), Leaded	80	60
Heat Resistant Alloys (cast), Ht Tr	270	185	Aluminum & Its Alloys, Ann	75	23
Martensitic Stainless Steels, Ann	260	150	Yellow Brasses (cast), Leaded	75	40
Low Alloy Steels (25XX), H & T	244	233	Tin Bronzes (cast), High Leaded	70	35
Austenitic Stainless Steels, CW	240	—	Ingot Iron, Ann	69	—
Aluminum Bronzes (cast), Ht Tr	235	180	Magnesium Alloys (forged)	69	47
Free-Cutting Steels, CD	230	150	Magnesium Alloys (cast)	65	50
Nickel Steels, HR	225	155	Red Brasses (cast), Leaded	65	50
Yellow Brasses (cast), High Strength	225	80	Magnesium Alloys (cast), Sol'n Tr	63	51
Heat Resistant Alloys (cast)	223	160	Zinc Alloys, HR	61	51
Manganese Steels, Ann	222	178	Gold, CW	58	—
Ruthenium (cast)	220	—	Platinum, Ann	52	38
Yellow Brass (cast), High Strength	220	80	Zinc, HR	47	37
Medium Carbon Steels, CW	219	181	Palladium, Ann	46	—
Nickel-Base Superalloys, Sol'n Tr	218	187	Copper, Ann	40	—
Medium Carbon Steels, HR	214	166	Silver, Ann	35	25
Medium Carbon Steels, H & T	213	207	Lead-Base Babbitts (chill cast)	28	14
Stainless Steels (cast), Ann	210	195	Tin-Base Babbitts (chill cast)	27	17
High Carbon Steels, Ann	208	192	Gold, Ann	25	—
Austenitic Nodular Irons	200	140	Pewter (cast)	23	—
Carbon Steels (cast)	200	120	White Metal (cast)	20	—
Aluminum Bronzes (cast)	195	120	White Metal, Ann	17	—
Copper, Hard	194	—	Hard Lead Alloys (chill cast)	15.4	7
Ferritic Stainless Steels, CW	185	—	Pewter, Ann	13	—
Austenitic Stainless Steels, Ann	170	150	Lead & Its Alloys (extr)	12.4	5.1
Iridium, Ann	170	—	Hard Lead Alloys (rolled)	9.5	5.9
Low Carbon Steels, CW	165	120	Grade A Tin, Ann	7	—
Manganese Bronze, Half Hard	160	—	Soft Lead (chill cast)	4.2	—
Yellow Brass, Hard	160	—			
Rhodium, Ann	156	55			

* Values represent high and low sides of a range of *typical* values.

Hardness of Plastics and Rubber[a]

Material ↓	High	Low	Material ↓	High	Low
ROCKWELL M HARDNESS			ROCKWELL R HARDNESS		
Melamines	M125	M110	Cellulose Acetate	R121	R39
Phenolics, Elec	M120	M100	Acetal	R120	—
Phenolics (cast), Mech & Chem	M120	M92	Cellulose Propionate	R120	R20
Phenolics, GP	M120	M108	Ethyl Cellulose	R120	R70
Phenolics, Shock & Ht Res	M120	M92	ABS Resins	R118	R30
Plastics Laminates, High Pressure	M120	M70	Nylon 6, 11, 66, & 610	R118	R103
Plastics Laminates, Low Pressure	M120	M80	Polycarbonate	R118	—
Ureas	M120	M116	Cellulose Nitrate	R115	R95
Allyls (cast)	M118	M92	CFE Fluorocarbons	R115	R110
Polyesters (cast), Rigid	M115	M65	Cellulose Acetate Butyrate	R114	R59
Epoxies (cast)	M110	M76	Diallyl Phthalate	R108	R107
Epoxies (molded)	M110	—	Chlorinated Polyether	R100	—
Diallyl Phthalate	M108	M100	Polystyrenes, Glass-Filled	R100	R90
Acrylics	M103	M80	Polypropylene	R95	R85
Nylons, Glass Fiber-Filled	M95	M85			
Polystyrene, Glass Fiber-Filled	M90	M80	DUROMETER A HARDNESS		
Rubber Phenolics	M90	M40	Hard Rubber	A95	A50
Silicones (molded), GP	M89	—	Neoprene & Nitrile Rubber	A95	A40
Modified Polystyrenes, Ht & Chem Res	M88	M78	Butyl Rubber	A90	A40
Polymethylstyrene	M86	M76	Natural Rubber	A90	A30
Polyvinyl Formal	M85	—	Styrene-Butadiene Rubber	A90	A40
Methylstyrene-Acrylonitrile	M83	—	Viton Rubber	A90	A60
Modified Polystyrenes, Impact Res	M80	M15	Polysulfide Rubber	A85	A40
Polystyrenes, GP	M80	M68	Silicone Rubber	A85	A40
Vinylidene Chloride	M65	M50	Fluorinated Acrylic Rubber	A55	—
Silicones (molded), Impact Res	M45	—	Urethane Rubber	A55	—

[a] Values represent high and low sides of a range of *typical* values; no relationship between different scales is implied.

Hardness of Nonmetallics (exc Plastics & Rubber)[a]

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Material ↓	High	Low	Material ↓	High	Low
Cubic Boron Nitride	7000	—	Zirconium Boride	1560	—
Diamond	7000	—	Chromium Carbide	1300	—
Boron Carbide	2800	—	Beryllia	1220	—
Titanium Boride	2720	—	Molybdenum Disilicide	1065	850
Silicon Carbide	2500	—	Quartz	800	—
Titanium Carbide	2460	—	Polycrystalline Glass	703	698
Beryllium Carbide	2300	—	Glasses	500	300
Zirconium Carbide	2090	—	Mica, Synthetic	200	—
Tantalum Carbide	2050	—	Calcite	130	—
Columbium Carbide	1880	—	Mica, Natural	90	—
Tungsten Carbide	1880	—	Gypsum	30	—
Cemented Carbides	1800	1400	Forsterite	7.5	—
High Alumina Ceramics	1750	1450	Cordierite	7	—

[a] Values represent high and low sides of a range of *typical* values.

Impact Strength of Metals[a]

Notched Izod, ft-lb

Material ↓	High	Low	Material ↓	High	Low
Austenitic Stainless Steels, Ann.	165	80	Low Alloy Steels (61XX), H & T	28	13
Austenitic Stainless Steels, CW	90	—	Ferritic Stainless Steels, Ann.	25	2
Martensitic Stainless Steels, Ann.	90	2	Low Alloy Steels (41XX), H & T	25	12
Low Alloy Steels (25XX), H & T	85	80	High Carbon Steels, H & T	22	5
Nitriding Steels, H & T	80	65	White Metal (cast)	22	—
Low Alloy Steels (86XX, 87XX), H & T	76	18	Carbon Steels (cast), Norm. & T	20	—
Martensitic Stainless Steels, H & T	75	2	High Carbon Steels, HR	18	4
Low Alloy Steels (46XX), H & T	68	25	Low Alloy Steels (51XX), H & T	16	6
Nickel-Base Superalloys	62	21	Tin Bronzes (cast), Leaded	16	7
Silicon Bronzes, Ann.	45	42	Tin (cast)	14	—
Low Alloy Steels (48XX), H & T	44	28	Low Alloy Steels (92XX), H & T	12	6
Yellow Brasses (cast), High Strength	40	7	Red Brasses (cast), Leaded	12	6
Low Alloy Steels (43XX), H & T	32	16	Tin Bronzes (cast), High Leaded	8	2
Cobalt-Base Superalloys, Sol'n Tr & Aged	31	4	Magnesium Alloys, Sol'n Tr	5	4
Carbon Steels (cast), Ann.	30	—	Magnesium Alloys (forged)	5	3
			Tin-Lead-Antimony Alloys (cast)	2.5	1
			Magnesium Alloys (cast), Sol'n Tr	2	1

[a] Values represent high and low sides of a range of *typical* values. Values in this table are not directly comparable to those for Plastics (below) because the methods of computing test results differ.

Impact Strength of Plastics

Notched Izod, ft-lb/in.

Material ↓	High	Low	Material ↓	High	Low
Phenolics (molded), Very High Shock	33	10	Modified Polystyrenes, High Impact	3	1
Polyvinyl Formal	20	0.8	Plastics Laminates, Mech	3	0.2
Silicones, High Impact	20	15	Cellulose Acetate, Hard	2.7	0.4
Plastics Laminates, Low Pressure	18	7	Prefoamed Polystyrene, Rigid	2.7	0.5
Nylon, Soluble	>16	—	Rubber Phenolics	2.3	0.3
Polycarbonate	16	12	Nylon 66 & 610	2	0.6
Plastics Laminates, GP	14.4	1	Epoxies (cast), Ht Res	1.5	0.2
Plastics Laminates, Elec	14	6	Melamines, Shock Res	1.5	0.5
Polyethylenes, High Density	14	0.4	Acetal	1.4	—
Alkyds, Impact	12	8	Diallyl Phthalate, Orlon-Filled	1.2	0.5
Melamines, Glass Fiber-Filled	12	4	Polyvinyl Chloride	1.2	0.25
Cellulose Propionate	11	0.8	Polypropylene	1.02	—
Modified Polystyrenes, Extra High Impact	11	6	Polyvinyl Butyral	1.02	0.74
ABS Resins, Low Temp Impact	10	6	Acrylics (molded, extr)	0.8	0.2
ABS Resins, Extra High Impact	9	5	Epoxies (molded)	0.8	0.3
Vinylidene Chloride	8	2	Epoxies (cast), GP	0.7	0.2
Polyesters (cast), Nonrigid	>7	—	Acrylics (cast)	0.5	0.4
Cellulose Nitrate	7	5	Phenolics (molded), GP	0.50	0.24
Epoxies (cast), Resilient	7	0.5	Diallyl Phthalate, Asbestos-Filled	0.45	0.30
Ethyl Cellulose, High Impact	7	3.6	Phenolics (cast)	0.45	0.23
Polystyrenes, Glass-Filled	6.1	4.1	Chlorinated Polyether	0.4	—
ABS Resins, High Impact	6	0.5	Melamines, Elec	0.40	0.28
Diallyl Phthalate, Glass Fiber-Filled	6	0.5	Methylstyrene-Acrylonitrile	0.40	—
Ethyl Cellulose, GP	6	1.8	Modified Polystyrenes, Ht & Chem Res	0.4	0.26
Cellulose Acetate Butyrate	5.4	0.6	Polyesters (cast), Rigid	0.40	0.18
Cellulose Acetate, Soft	5.2	1.7	Alkyds, GP & Elec	0.35	0.30
Nylon, Glass-Filled	5	2.5	Melamines, GP	0.35	0.24
Diallyl Phthalate, Dacron-Filled	4.5	1.7	Polystyrenes, GP	0.35	0.25
Cellulose Acetate, Medium	4	1.1	Ureas	0.35	0.24
TFE & CFE Fluorocarbons	4	2.5	Allyls (cast)	0.32	0.18
Nylon 6	3.6	1.2	Silicones, GP	0.30	0.25
Phenolics (molded), Heat & Shock	3.5	0.27	Vinylidene Chloride, Oriented	0.05	—

Creep Strength of Metals

Material	Form, Condition	Stress (1000 psi) for 0.01% Creep per 1000 Hr at Indicated Temp (F)					Stress (1000 psi) for 0.1% Creep per 1000 Hr at Indicated Temp (F)				
Up to 800 F		300	400	500	600	800	300	400	500	600	800
NONFERROUS METALS											
Coppers	Wrought (annealed)	3–8	1.5–5	0.4–2.6	—	—	—	—	—	—	—
Nonleaded Brasses	Wrought (annealed)	0.9–19	2–11	0.3–23	—	—	25	5–9	1–2	—	—
Bronzes	Wrought (annealed)	14–23	5–10	2–5	—	—	—	—	—	—	—
Cupro-Nickel	Wrought (water quenched, aged)	25–40	15–30	8–30	—	—	—	22	13	—	—
Aluminum 2024-T	Sheet	23	9.5	2.5	1.5	—	30	13	3	2	—
Aluminum 7075-T	Sheet	12	4	2.5	1.5	—	16	6	3	2	—
Titanium (commercial)	Sheet (annealed)	—	38	—	32	10	37	40	37	32	13
Ti-6Al-4V	Sheet (annealed)	—	—	—	—	—	—	—	—	80	—
Ti-7Al-4Mo	Bar or Forging (annealed)	—	—	—	—	—	—	—	—	85	18
Above 800 F		1000	1100	1200	1500	1600	1000	1100	1200	1500	1600
CARBON AND LOW ALLOY STEELS											
Low Carbon Steel	Wrought, Cast	1.8	—	0.1	—	—	3.3–5	—	0.5	—	—
Carbon-Molybdenum Steels	Wrought, Cast	5–7	3	1	—	—	10–12	4	2	—	—
Chromium-Molybdenum Steels (0.5–3%)	Wrought, Cast	6–12	2–4	1–2.5	—	—	10–20	3–8	2–4.5	—	—
Chromium Steels											
4–6%	Wrought, Cast	6–7	2.5–3.5	1–2	—	—	8–11	5–6.5	2–3.5	—	—
6–10%	Wrought, Cast	5–9	2.5–4	1–2	—	—	8–12	4–6	2.5–3	—	—
STAINLESS STEELS											
Martensitic Chromium Steels (403, 410, 416, 420)	Wrought	8	3.5	1.3	—	—	9.2	4.2	2	—	—
Ferritic Chromium Steels (405, 430, 440)	Wrought	4.2–7	2.3–4.5	1.0–1.6	—	—	6–8.5	3–5	1.5–2.2	—	—
Nickel-Chromium Steels											
304, 316, 321, 347	Wrought	12–17	7.5–11.5	4.5–7	1–2	—	17–25	12–18.2	7–12.7	1.2–2.8	—
309	Wrought	—	—	4	0.5	—	15.9	11.6	8	1.0	—
310, 314	Wrought	17	13	8	2	—	17	13–14	9	1–2.5	—
HEAT RESISTANT CAST HIGH ALLOYS											
Iron-Chromium Alloys (HA, HC, HD)	Cast	—	—	—	—	—	—	—	—	1.2–3.5[a]	0.7–1.9
Iron-Chromium-Nickel Alloys (HE, HF, HH, HI, HK, HL)	Cast	—	—	—	—	—	—	—	—	3.5–7[a]	2–4.3
Nickel-Chromium Alloys (HN, HT, HU, HW, HX)	Cast	—	—	—	—	—	—	—	—	6–8.5[a]	3–5
SUPERALLOYS											
Inconel X		—	—	—	—	—	—	—	64	12.3	9.0
19-9 DL		—	—	—	—	—	—	—	20	7.1	2.4
Hastelloy X		—	—	—	—	—	—	—	—	—	—
N-155		—	—	—	—	—	—	—	18.4[b]	10.3	—
S-816		—	—	—	—	—	—	—	42	11.5	5.8

[a] At 1400 F. [b] At 1350 F.

Stress-Rupture Strength of High Temperature Alloys

10 Hr

1200 F		1500 F		1800 F	
Alloy	Stress, 1000 psi	Alloy	Stress, 1000 psi	Alloy	Stress, 1000 psi
Waspaloy	130	Inconel 713[a]	70	Mo-0.5 Ti[d]	65
M-252	120	René 41	65	Columbium[d]	53
Incoloy 901[b]	110	U-500	62	Molybdenum[d]	30
W-545	95	1753	60	Inconel 713[a]	24
Inconel X	92	Waspaloy	58	GMR-235[a, b]	16
Refractaloy 26	92	Inconel 700[b]	55	1753	16
S-816	83	GMR-235[a, b]	52	V-36[b, e]	13
A-286	80	M-252	48	X-40[a]	13
Inco 702[a, b]	75	Inconel X	38	HS-21[a]	12.5
Hastelloy B	71.5	Refractaloy 26	36	M-252	12
Discaloy[c]	70	X-40[a]	33	HS-25	11.5
HS-21[a]	70	S-816	31	Inconel 700[b]	9
Refractaloy 70	70	HS-25	30	N-155	8.8
Hastelloy C	69	Hastelloy B[a]	29	Hastelloy X[a]	8
Nivco	66	V-36[b, c]	29	HK[a]	6.5
N-155	62	S-590	28	HH[a]	6
S-590	62	HS-21[a]	27	HT[a]	5.8
X-40[a]	61	Hastelloy B	26	Inco 702[a, b]	4.2
Hastelloy X	58	Hastelloy C	26		
16-25-6	55	N-155	26		
N-155[a]	52	Hastelloy C[a]	25		
19-9DL	50	N-155[a]	25		
HH[a]	46	16-25-6	24		
HT[a]	41	Inco 702[a, b]	23		
HF[a]	37	A-286	22		
HK[a]	35	Hastelloy X	22		
Hastelloy X[a]	34	Hastelloy X[a]	20		
		19-9DL	20		
		HT[a]	16.5		
		HH, HK[a]	16		
		HF[a]	13		

100 Hr

1200 F		1500 F		1800 F	
Alloy	Stress, 1000 psi	Alloy	Stress, 1000 psi	Alloy	Stress, 1000 psi
1753	115	Nicrotung[a]	65	Mo-0.5 Ti-0.07 Zr[e]	70
Waspaloy	110	Inconel 713C[a]	55	Mo-0.5 Ti[e]	62
Inconel 700	100	1753	47	Mo-0.5 Ti-0.07 Zr[d]	40
U-212	100	René 41	45	Columbium[d]	36
M-252	98	Udimet 500	45	Mo-0.5 Ti[d]	28
D979	94	Inconel 700	43	Molybdenum[e]	22
W-545	90	Waspaloy	40	Nicrotung[a]	22
GMR-235[a]	86	GMR-235[a]	38	Inconel 713C[a]	16
Incoloy 901	85	M-252	37	Udimet 700	16
Refractaloy 26	80	D-979	36	GMR-235[a]	13
HS-25	70	S-816	29	Udimet 500	12
S-816	65	X-40[a]	29	Molybdenum[d]	11.5
A-286	63	S-816[a]	28	X-40[a]	11.3
Refractaloy 70	56	Refractaloy 26	27	S-816[a]	11
S-816[a]	56	HS-25	24	HS-21[a]	9.4
Discaloy	55	V-36	24	V-36	9
Hastelloy C	55	HS-21[a]	22	Waspaloy	8
Inconel 702	55	S-590	22	HS-25	7.5
Nivco	54	Incoloy 901	20	Inconel 700	5.6
HS-21[a]	52	N-155	20	N-155	5
Hastelloy B[a]	51	N-155[a]	19	HT, HK[a]	4.5
Hastelloy B	50	Refractaloy 70	19	Inconel 702	3.1
N-155	50	Hastelloy C[a]	18.5		
S-590	50	Hastelloy B[a]	18		
Hastelloy C[a]	49.5	Hastelloy C	18		
N-155[a]	49	Hastelloy B	17		
Hastelloy X	44	Inconel 702	16		
X-40[a]	44	Hastelloy X	15.5		
16-25-6	44	Discaloy	15		
19-9DL	44	A-286	14		
HH[a]	35	16-25-6	13.5		
Hastelloy X[a]	32	19-9DL	13		
HT[a]	32	HT[a]	12		
Hastelloy X[a]	32	HH[a]	11.5		
HF[a]	30	HK[a]	10.5		
HK[a]	25	HF[a]	9		

[a] Cast. [b] Estimated. [c] Sheet. [d] Annealed or recrystallized. [e] Stress relieved.

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